# Financial Crisis and the Supply of Corporate Credit

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# Motivation

A number of works show the **bank lending channel** can have a severe impact on the economy when in distress.

- Noticeably, Bernanke (AER, 1983) shows that the U.S. economy slipped from a typical recession into the Great Depression because failures disrupted lending relationships and caused a large contraction in aggregate demand.
- Reinhart and Rogoff (2009) document that banking crises have been followed by particularly long and extreme contractions in economic activity.

# Motivation (Cont.)

Several studies find **support** for a powerful bank lending channel during the recent financial crisis.

- **Campello, Graham, and Harvey** (JFE, 2010)
- Ivashina and Scharfstein (JFE, 2010)
- Edgerton (WP, 2012)
- Chodorow-Reich (QJE, 2014)
- **Carvalho, Ferreira, and Matos** (JFQA, 2015)

# Motivation (Cont.)

However, other research provides evidence that casts **doubts** on the importance of the bank lending channel.

- **Kahle and Stulz** (JFE, 2013)
- Campello, Giambona, Graham, and Harvey (RFS, 2011)
- De Fiore and Uhlig (JMCB, 2015)

# Purpose of this Paper

We provide answers to three important **questions**:

1. Did bank borrowing and corporate investment decline more at U.S. firms that had relationships with distressed banks?
2. Did rated firms paired with distressed banks disintermediate by issuing bonds?
3. Was the bank lending channel during the financial crisis economically important in depressing corporate investment and economic activity?

# Main Findings

1. We show that lead-bank **distress** negatively affected borrowing in 2008, and investment in 2009, but only for **rated** firms.

2. Firm **migration** to the public debt market was **insufficient** to offset the adverse effects from the contraction in bank credit.

3. Our best estimate is that the bank lending channel accounts for about 48% of the 2009 decline in corporate investment.

# Empirical Strategy

- We follow the **borrowing history** of public corporations in the syndicated loan market and corporate bond market.
- We **hand-match** firms to their lead banks and relate firm borrowing to bank conditions.
- We analyze **firm investment** in relation to lead **bank conditions**.
- Lastly, we check our **micro-level** findings againts a **macro-level** analysis.

# Corp. Borrowing Dynamics: Univariate Analysis

Our analysis of firm borrowing dynamics reveal that:

1. **Rated firms** were far more dependent on **external funds** than unrated firms in any given year.
2. **Bank credit dropped** for all firms during the crisis years, but the decline was **more severe** for **rated firms**.
3. Significant **migration** from loans to bonds by rated firms during the crisis years **offset some** but **not all** of the decline in bank borrowing.
4. There is a clear **recovery** in credit markets for all firms in the **post-crisis** years 2010 and 2011. Noticeably, however, rated firms seem to rely more on bond issues than pre-crisis.

# Corp. Borrowing Vectors

**Table 2. Borrowing Outcomes and Transition Matrices**

*Panel A. Observed Aggregate Debt Funding*

| | **Unrated Firms** | | | **Rated Firms** | | |
|---|---|---|---|---|---|---|
| | Pre-Crisis | Crisis | Post-Crisis | Pre-Crisis | Crisis | Post-Crisis |
| No Debt | 0.52 | **0.63** | 0.51 | 0.30 | **0.48** | 0.29 |
| Loans | 0.48 | **0.37** | 0.49 | 0.59 | **0.29** | 0.49 |
| Bonds | | | | 0.11 | **0.23** | 0.22 |

# Corp. Borrowing Transition Matrices

**Table 2. Borrowing Outcomes and Transition Matrices**

*Panel B. Average Borrowing Transition Matrices*

| | | **Unrated Firms Initial State (t)** | | **Rated Firms Initial State (t)** | | |
|---|---|---|---|---|---|---|
| | **Final State (t)** | No Debt | Loans | No Debt | Loans | Bonds |
| **Pre-crisis** | No Debt | 0.38 | 0.67 | 0.30 | 0.41 | 0.29 |
| | Loans | 0.62 | 0.33 | 0.61 | 0.50 | 0.34 |
| | Bonds | | | 0.09 | 0.09 | 0.37 |
| **Crisis** | No Debt | 0.53 | 0.81 | 0.52 | **0.62** | **0.38** |
| | Loans | 0.47 | 0.19 | 0.30 | **0.26** | **0.14** |
| | Bonds | | | 0.18 | **0.12** | **0.48** |
| **Post-crisis** | No Debt | 0.35 | 0.72 | 0.18 | 0.45 | 0.24 |
| | Loans | 0.65 | 0.28 | 0.62 | 0.43 | 0.40 |
| | Bonds | | | 0.20 | 0.12 | 0.36 |

# Corp. Borrowing Dynamics: Multivariate Results

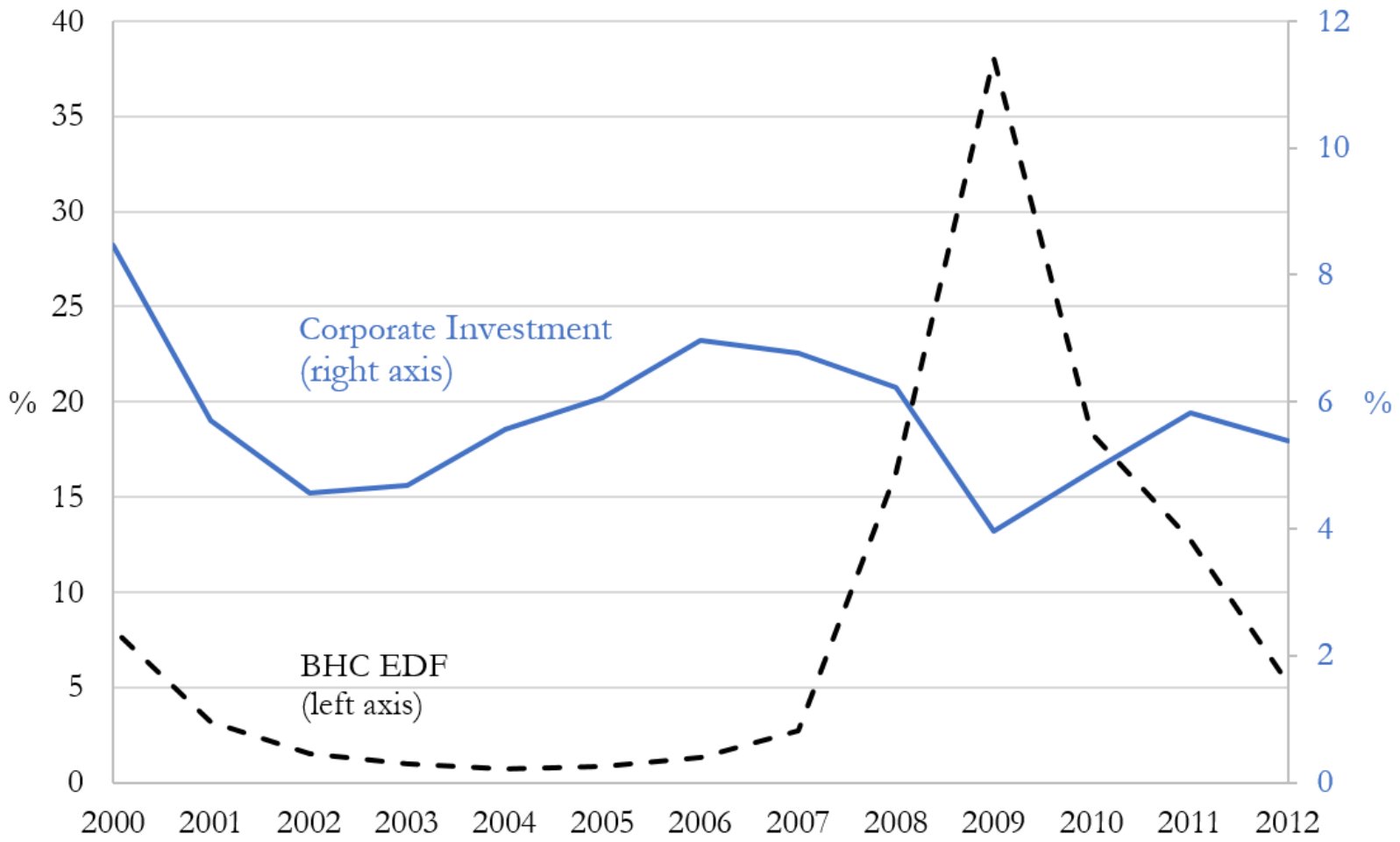
- Next, we relate borrowing migration to banking industry and lead bank conditions.

**Table 4. Migration of Corporate Debt Funding Outcomes**

*Model 1: EDF Bracket as Proxy for Lead Bank Condition*

| | **Debt Funding Outcome at Period t+1** | | | | | |
|---|---|---|---|---|---|---|
| | **Unrated Firms** | | **Rated Firms** | | | |
| **Migration from Bank Debt at** *t* | No Debt | | No Debt | | Public Debt | |
| Borrower Attributes (t) | Yes | | Yes | | Yes | |
| *Banking Industry Distress (t+1)* | | | | | | |
| Industry EDF | 1.675 | * | 1.210 | | 5.801 | *** |
| *Lead Bank Distress (t+1)* | | | | | | |
| EDF Bracket | -0.013 | | -0.016 | | 0.053 | *** |
| EDF Bracket x D08 | 0.001 | | 0.094 | *** | 0.028 | |
| EDF Bracket x D09 | -0.016 | | 0.040 | | -0.040 | |
| Observations | 3760 | | 2556 | | | |
| Pseudo R-Squared | 0.028 | | 0.109 | | | |

# Corp. Investment: Micro-Level Data




Investment

# Corp. Investment: Micro-Level Evidence

- Corporate investment **plummeted** from 6.2% in 2008:Q2 to 4.0% in 2009:Q2 while banking industry distress shot up.
- We show that bank conditions were related to corporate investment among **rated** firms – and not so among **unrated** ones. In order to do so, we estimate the model:

$$Investment_{i,t+1} = \alpha + \phi \mathbf{F}_{i,t} + \mu \mathbf{M}_{i,t+1} + \gamma b_{l,t+1} + \tau \mathbf{Y}_{t+1} + \epsilon_{i,t+1}$$

where $b$ proxies for the **lead bank conditions**, using either EDF Bracket or S&P Rating Downgrade.

- We then **extrapolate** our results to the universe of firms in Compustat.

# Corp. Investment: Micro-Level Evidence

**Table 5. Firm Financing and Investment by Rating Status and Lead Bank Condition**

*Panel A. Investment Rates*

| | **Unrated Firms** | | | | **Rated Firms** | | | |
|---|---|---|---|---|---|---|---|---|
| | Lead Bank | | | | Lead Bank | | | |
| Year t+1 | Healthy | Distressed | Diff. | p-val. | Healthy | Distressed | Diff. | p-val. |
| 2006 | 0.087 | 0.075 | 0.012 | 0.23 | 0.062 | 0.068 | -0.007 | 0.54 |
| 2007 | 0.078 | 0.074 | 0.004 | 0.70 | 0.124 | 0.066 | 0.058 | 0.00 |
| 2008 | 0.066 | 0.072 | -0.006 | 0.63 | 0.088 | 0.069 | 0.019 | 0.30 |
| 2009 | 0.042 | 0.043 | -0.001 | 0.85 | **0.093** | **0.048** | **0.045** | **0.00** |
| 2010 | 0.041 | 0.047 | -0.006 | 0.47 | 0.060 | 0.066 | -0.005 | 0.80 |
| 2011 | 0.067 | 0.073 | -0.006 | 0.60 | 0.068 | 0.088 | -0.020 | 0.24 |

# Corp. Investment: Micro-Level Evidence

- Our regression results show bank distress had a **negative impact** on **rated** firms' investment, both in 2008 and 2009.
- Unrated firms suffered less from bank distress, probably because they entered the crisis with more cash and lower leverage.
- We **extrapolate** results from our corporate investment regression by adding up coefficients $\gamma$ that reflect the effect of bank distress on the different firm groups and scaling by their weight in Compustat.

$$\Delta(Investment_{t+1}/TA_t) = \sum_g \gamma_{g,t+1} * 10 * (TA_{r,t}/TA_t)$$

# Corp. Investment: Micro-Level Evidence

**Table 7. Economic Significance of Bank Distress on Corp. Investment**

*Panel A. Interquartile Change in EDF Brackets, Year 2009*

| | Reg. Coeff. | | Chg. EDF | | Asset Weights | | Estimated Chg. Investment | | |
|---|---|---|---|---|---|---|---|---|---|
| | Unrtd | Rated | Unrtd | Rated | Unrtd | Rated | Unrtd | Rated | Combined |
| $\gamma_1$: Bank Distress x D09 | -0.072 | **-0.126** | 10 | 10 | 20.0% | 80.0% | -0.14% | **-1.01%** | -1.15% |
| $\gamma_2$: Bank Distress x D09 x No Debt t+1 | 0.105 | **0.005** | 10 | 10 | 2.0% | 16.0% | 0.02% | **0.01%** | 0.03% |
| $\gamma_3$: Bank Distress x D09 x Bond Issue t+1 | | **0.088** | 10 | 10 | | 8.0% | 0.00% | **0.07%** | 0.07% |
| F-test (p-val), H0: $\gamma_1+\gamma_2=0$ | 0.145 | **0.077** | | | | | | | |
| Total effect | | | | | | | -0.12% | **-0.93%** | **-1.05%** |

# Corp. Investment: Macro-Level Evidence

- We use **BEA input-output** data to show that industries with **heavier reliance** on **financial inputs** experienced **larger falls** in investment and output during the financial crisis.
- Declines in investment and output were **more sensitive to intermediated (bank) financing** than direct (public) financing during the crisis, particularly in 2009.
- We estimate panel regressions for the model of **activity** – i.e. **investment** or **output**, alternatively:

$$\begin{aligned}\Delta Activity_t = \alpha + \beta_1 * IF_{j,t-1} + \beta_2 * (IF_{j,t-1} * D08) + \\ \beta_3 * (IF_{j,t-1} * D09) + \gamma_1 * DF_{j,t-1} + \\ \gamma_2 * (DF_{j,t-1} * D08) + \gamma_3 * (DF_{j,t-1} * D09) + \epsilon_t\end{aligned}$$

# Corp. Investment: Macro-Level Evidence, I-O Matrices

**Table 8. Input-Output Analysis**

| | %Δ Investment | | %Δ Output | |
|---|---|---|---|---|
| Constant Term | 3.938 | *** | 4.043 | *** |
| Financial Inputs (Lagged) | | | | |
| $\beta_1$: Intermediated | 0.366 | | 0.145 | ** |
| $\beta_2$: Intermediated * D08 | -0.839 | | -0.213 | |
| $\beta_3$: Intermediated * D09 | -3.424 | *** | -1.245 | *** |
| $\gamma_1$: Direct | 0.329 | *** | 0.054 | |
| $\gamma_2$: Direct * D08 | -0.879 | *** | -0.052 | |
| $\gamma_3$: Direct * D09 | -0.904 | *** | -0.347 | *** |
| Industry Effects | Yes | | Yes | |
| Obs. | 928 | | 1,024 | |
| Adjusted-R2 | 0.071 | | 0.047 | |
| F-tests (p-val), H0: | | | | |
| $\beta_1 = \gamma_1$ | 0.880 | | 0.265 | |
| $\beta_2 = \gamma_2$ | 0.958 | | 0.490 | |
| $\beta_3 = \gamma_3$ | **0.002** | | **0.000** | |
| $\beta_1 + \beta_2 = \gamma_1 + \gamma_2$ | 0.915 | | 0.765 | |
| $\beta_1 + \beta_3 = \gamma_1 + \gamma_3$ | **0.002** | | **0.001** | |

# Results in the Context of the Literature

- Carvalho, Ferreira, and Matos (JFQA, 2015). We arrive at similar conclusions. However, our methodology is more direct: we match lenders and borrowers and take into account heterogeneity among lenders.
- Kahle and Stulz (JFE, 2013). They find a fall in investment for 2009:2-2010:1 and attribute it mainly to a fall in demand. By matching lenders and borrowers we show that banking relationships do matter in explaining borrowing outcomes and, ultimately, fall in investment.
- Campello, Graham, and Harvey (JFE, 2010). Our empirical results support their survey findings. In particular, the timing coincides in that fall in investment became most acute in 2009.

# Conclusion

- We show that **rated** firms paired with distressed lead banks reduced **investment** sharply in 2009.
- **Some** publicly traded firms with credit ratings were able to **disintermediate**, but the additional investment by these firms was moderate relative to many other firms that could not secure debt.
- Our best estimate is that the bank lending channel accounted for 48% of the decline in investment in 2009.
- The **bank lending channel** remains **important** in crisis because loans and bonds remain imperfect substitutes.

# Thank You

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